Feeding Cottonseed Products To Livestock

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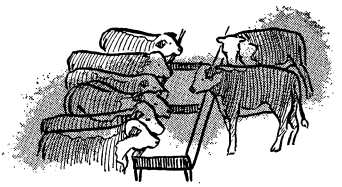

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Value of Cottonseed Products as Livestock Feeds

COTTONSEED PRODUCTS have been extensively fed to stock in the South for many years. More recently their use has become general in many sections outside the Cotton Belt. It is estimated that approximately 2.5 million tons of cottonseed meal have been used annually for feeding purposes in the United States during the last 10 years.

Other protein feeds, such as soybean meal, peanut meal, copra meal, linseed meal, milk byproducts, fish meal, and meat meal, are available as protein supplements. Roughly these feeds are similar in nutritive value. They differ somewhat in the relative protein value and in vitamins and inorganic matter.

Composition of Cottonseed Products

Many cottonseed products, both concentrates and roughages, are used as livestock feeds. All the concentrate products have the same general characteristics and qualities, their chemical composition depending mainly on the form of manufacture and the thoroughness in separating out the hulls. Among the more common cottonseed products used as feeds are cottonseed meal and cake, whole-pressed cottonseed and cottonseed hulls. Table 1 gives analyses representing these products, marketed by manufacturers to conform to the definitions adopted by the Association of American Feed Control Officials.

Untreated cottonseed contains a substance called gossypol, which is toxic, and precautions must be exercised in feeding it to swine and poultry. This substance is made inactive by cooking the seed after adding water. Also, the cooking and expelling processes to which cottonseed meal is subjected in order to remove the oil are in large measure destructive to the toxic principle in the raw seed. The extent to which each step in the varied methods of manufacture affects the toxicity of the meal is not yet fully determined. Meals of improved quality, often labeled as suited for swine and poultry, are now being marketed in quantities.

Cottonseed is a good source of protein, potash, and phosphorus, but is deficient in calcium and carotene (vitamin A). An adequate quantity of calcium is especially important to milking or nursing animals and to young stock and may be supplied satisfactorily by legume hays or as a mineral supplement. Some nutritional failures attributed to cottonseed meal have been the result of using it with poor-quality roughages, such as

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TABLE 1.—*Composition of cottonseed products (pounds of nutrients in 100 pounds)*

Product	Water	Ash	Crude protein	Carbohydrates		Fat (ether extract)
				Fiber	Nitrogen-free extract	
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
Cottonseed	9. 1	4. 0	19. 6	18. 9	28. 3	20. 1
Cottonseed meal and cake:						
36 percent protein	7. 5	5. 4	37. 1	14. 4	29. 8	5. 8
41 percent protein	7. 4	6. 2	41. 0	10. 8	28. 1	6. 5
43 percent protein	7. 0	5. 8	43. 9	10. 5	26. 1	6. 7
43 percent protein (solvent)	8. 1	5. 5	43. 7	11. 9	28. 9	1. 9
Whole-pressed cottonseed	6. 5	4. 8	28. 3	22. 5	31. 9	6. 0
Cottonseed feed:						
41 percent protein	8. 0	6. 4	41. 7	10. 3	27. 7	5. 9
Cottonseed hulls	8. 7	2. 6	3. 5	46. 2	38. 0	1. 0

hulls or straw. A satisfactory ration in which cottonseed meal is used as the concentrate should contain an adequate supply of carotene and possibly certain other nutritive elements supplied by such roughages as legume or other hays of good quality or by pasturage. The value of cottonseed meal lies primarily in its protein content; it is used to help make up any protein deficiency.

Grades and Classes of Cottonseed Products

Cottonseed (uncrushed) was formerly used extensively as a feed for livestock. Cottonseed products have largely taken the place of the seed as a feedstuff. One pound of good-quality cottonseed meal is equal to nearly 2 pounds of cottonseed as a feed for fattening steers. Large rations of cottonseed tend to produce scours, but when used in quantities up to 5 or 6 pounds there is little or no trouble of this sort.

Cottonseed contains about 20 percent each of fat or oil and crude protein. Compared with a good grade of cottonseed meal it contains about half as much protein and about three times as much oil.

A ton of cottonseed will yield approximately the following quantities of products: Linters or short fiber, 110 pounds; hulls, 514 pounds; cake or meal, 954 pounds; crude oil, 303 pounds; dirt and loss in manufacture, 119 pounds.

Cottonseed cake is the product resulting from the pressing or extracting of the oil from the cottonseed kernel with only a small portion of the hull remaining. The Association of American Feed Control Officials stipulates that the cake or meal must contain "not less than 36 percent of crude protein."

Cottonseed cake and cottonseed meal are practically one and the same thing; that is, the meal is the cake in a ground form. The meal is most commonly used, but the cake has a distinct advantage in certain cases. The cake is preferred by those who feed their cattle in the open where the wind may blow the meal away. On the range or pasture the cake is often broken up

and fed in troughs or spread on the ground. If meal were used, the loss would be very large.

In recent years a considerable tonnage of cottonseed cake has been broken into different-sized pieces and then marketed. The products include nut-size, sheep-size, pea-size, and pebble-size. In addition the cake has been ground and processed through a cubing or pelleting machine and marketed as cottonseed cubes or pellets.

When whole, unhulled cottonseed is pressed, the resulting product is known as whole-pressed cottonseed. The crude protein is necessarily considerably lower in such a product than in cottonseed cake or meal.

Cottonseed hulls are the roughage product of cottonseed-oil manufacture. The hulls are removed from the cottonseed before the oil is extracted. They have a very low-protein content and should be fed only in connection with protein-rich feeds. As a roughage the hulls have a lower feeding value than oat straw or corn stover, but are valuable where no other roughage is available. This product is used extensively in the South, especially for steer feeding.

Cottonseed-hull bran is ground cottonseed hulls from which the lint has been removed. The feeding value of the bran is not appreciably greater than that of ordinary cottonseed hulls.

Economy of Using High-Grade Cottonseed Products

Cottonseed products containing a high percentage of protein command relatively high prices, but judged from the cost of the protein contained they are comparatively cheap. These products are usually purchased for their protein content, and prices paid should be based on the protein in them. The value per pound of the protein in feeds at various prices and containing varying guaranteed analyses of protein is shown in table 2.

The poorer grades of cottonseed meal or cake usually sell at prices only a little lower than the higher grade products. By obtaining commercial prices on both high-grade

TABLE 2.—*Cost per pound of protein in feeds at various prices per ton*

Cost of feed per ton	Percent of protein in feeds										
	12	16	20	24	28	32	36	38	41	43	45
	Cents	*Cents*	*Cents*	*Cents*	*Cents*	*Cents*	*Cents*	*Cents*	*Cents*	*Cents*	*Cents*
$35.00	14.58	10.94	8.75	7.29	6.25	5.47	4.86	4.61	4.26	4.07	3.89
40.00	16.67	12.50	10.00	8.33	7.14	6.25	5.55	5.26	4.88	4.65	4.44
45.00	18.75	14.06	11.25	9.38	8.03	7.03	6.25	5.92	5.49	5.23	5.00
50.00	20.83	15.63	12.50	10.42	8.93	7.81	6.94	6.58	6.09	5.81	5.55
55.00	22.91	17.19	13.75	11.46	9.82	8.59	7.64	7.24	6.71	6.40	6.11
60.00	25.00	18.75	15.00	12.50	10.71	8.38	8.33	7.89	7.32	6.97	6.67
65.00	27.08	20.31	16.25	13.54	11.67	10.16	9.03	8.55	7.92	7.56	7.22
70.00	29.16	21.87	17.50	14.58	12.50	10.94	9.72	9.21	8.53	8.14	7.78
75.00	31.25	23.44	18.75	15.62	13.39	11.72	10.41	9.87	9.14	8.72	8.33
80.00	33.33	25.00	20.00	16.67	14.28	12.50	11.11	10.53	9.75	9.32	8.89
85.00	35.41	26.56	21.25	17.71	15.18	13.28	11.80	11.18	10.36	9.88	9.44
90.00	37.50	28.13	22.50	18.75	16.07	14.07	12.50	11.84	10.98	10.47	10.00
95.00	39.59	29.69	23.75	19.79	16.97	14.85	13.20	12.50	11.59	11.05	10.55
100.00	41.67	31.25	25.00	20.83	17.86	15.63	13.89	13.16	12.20	11.63	11.11
105.00	43.75	32.81	26.25	21.87	18.75	16.41	14.58	13.82	12.81	12.21	11.67
110.00	45.84	34.38	27.50	22.91	19.65	17.19	15.28	14.48	13.42	12.79	12.22

and low-grade products and referring to table 2, one can ascertain approximately which feed will provide protein at the least cost. However, the feeding values of different feeds having essentially the same coefficients of digestibility are not exactly proportional to their respective protein contents. A low-protein feed usually has a higher content of carbohydrates, which may partially make up in feeding value for the difference in protein content.

Good cottonseed meal contains three times as much digestible protein and as much digestible carbohydrates and fat combined as there is in wheat bran. One pound of cottonseed meal will balance as much corn as 3 pounds of bran.

Cottonseed Products for Various Classes of Livestock

The rations in the succeeding pages may be used as the average and may be adjusted to suit local conditions. If the suggested rations cannot be used, substitute other feeds of the same general character as those in the rations. These rations are designed primarily to show the proper proportions in which to use cottonseed products and no attempt is made to cover all conditions.

The quantities for the different classes of animals are given in pounds. While it is important to weigh the meal as fed, it may be entirely satisfactory merely to weigh at frequent intervals the contents of a certain measure or vessel. Table 3 gives equivalent weights and measurements of cottonseed products.

TABLE 3.—*Equivalent weights and measures of cottonseed products*

Product	1 quart weighs—	1 pound measures—
	Pounds	*Quarts*
Cottonseed	0. 8	1. 3
Cottonseed meal	1. 5	. 7
Cottonseed hulls	. 3	3. 3

Fattening Cattle in Dry Lot

Fattening or carbohydrate feeds should be fed in conjunction with roughages and supplemented with feeds rich in protein. In many of the cattle-fattening areas the protein supply is limited. When there is an abundance of legume hay, such as clover or alfalfa, and its market value is not excessive, it is unnecessary to supply any additional protein in the form of a meal or cake. However, when protein can be supplied more cheaply in the latter form, it may be advisable to replace part of the hay with a meal or cake.

Protein concentrates, such as cottonseed meal or cake, are used generally in rations in which straw, stover, or silage makes up the roughage. In buying cottonseed products as a source of protein, purchase the feed that will supply protein most cheaply, according to percentage of protein and price per ton. For example, cottonseed meal having a protein content of 45 percent and priced at $45 a ton will supply protein more cheaply than 36 percent meal at $35 a ton (table 2).

In many sections of the South there is a shortage of carbohydrate feeds (grains) for fattening purposes, and considerable quantities of cottonseed hulls are fed along with cottonseed meal. This type of ration is more adaptable to cattle 2 years old and over, and for short feeding periods.

Suggested rations for fattening steers averaging 600 pounds in weight

RATION 1

	Pounds
Corn or barley (ground)	11
Mixed hay	4
Cottonseed meal	2

RATION 2

Corn	10
Oat straw	4
Corn silage	10
Cottonseed meal	2

RATION 3

Grain sorghums	10
Sorgo fodder	6
Cottonseed meal or cake	2

RATION 4

Corn	5
Molasses	2
Cottonseed hulls	14
Cottonseed meal	3

Fattening Cattle on Grass

Cottonseed products are commonly used as supplements in the fattening of cattle on grass. Cottonseed cake is frequently used as the sole supplemental feed, but more often cottonseed meal or cake is used in a mixture with corn or other grain. A desirable mixture for use as a supplement for cattle on grass is 8 parts by weight of corn or other grain and 1 part of cottonseed meal or cake. Cattle fattened on grass with a supplement are usually allowed all the feed they will eat once a day in addition to grass. Usually cattle on pasture will not eat more than one-half the feed that would ordinarily be eaten in dry-lot feeding.

Wintering Cattle

Cottonseed meal is ordinarily fed to cattle in the winter period only, and then only in amounts sufficient to supply the necessary protein. It is especially valuable in connection with cheap roughages and silages. For cattle weighing from 500 to 750 pounds, from 1 to 2 pounds of the meal daily is enough to balance most roughage rations properly. If legume hays, such as alfalfa or clover, constitute half or more of the roughage ration, there is little or no need for cottonseed meal.

Few combinations are more economical than a ration of corn silage, straw, and cottonseed meal for wintering cattle. One to 2 pounds daily of cottonseed meal combined with whatever silage and straw they will eat should keep them in thrifty condition. The cost of wintering cattle on such a ration can usually be lessened by permitting them to run in the stalk fields or on pastures reserved for winter and giving them feed at night only.

Suggested rations for wintering cattle averaging 650 pounds in weight

RATION 1

	Pounds
Corn (or sorgo) silage	20
Oat or wheat straw	Unlimited
Cottonseed meal	1

RATION 2

Corn (or sorgo) silage	20
Cottonseed meal	1
Straw or stover	Unlimited

RATION 3

Cottonseed hulls	15
Grass hay	5
Cottonseed meal	2

RATION 4

Cottonseed cake	1
Silage, to supplement winter pastures	15 to 20

Breeding Cattle

In feeding cottonseed meal (fig. 1) to breeding beef cows, two classifications may be made—dry cows and cows that nurse calves. The amount of cottonseed meal that should be fed to dry cows depends on the other feeds used. A good ration is 25 to 30 pounds of corn silage, from 1 to 1½ pounds of cottonseed meal or cake, and other roughage, such as stalks in the field, corn stover, hay, or straw.

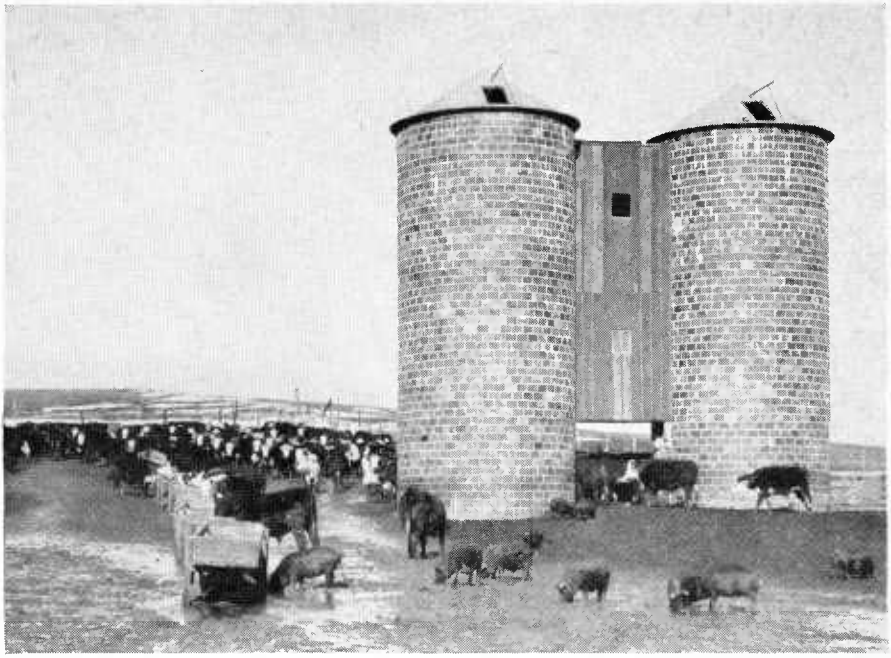

FIGURE 1.—Cottonseed meal, straw, and corn silage make a good feed combination for beef cattle. The meal supplies the protein that the silage lacks.

Cows that are nursing calves should receive more protein supplements than dry cows, but the amounts fed should not be greater than is necessary to balance properly the other feeds, which may consist largely of roughages. Ordinarily beef cows raising calves are fed not more than 2 pounds of supplements each daily, and then only during the winter period. It is advisable to feed a carotene-rich supplement if the roughage consists largely of straw, cornstalks,

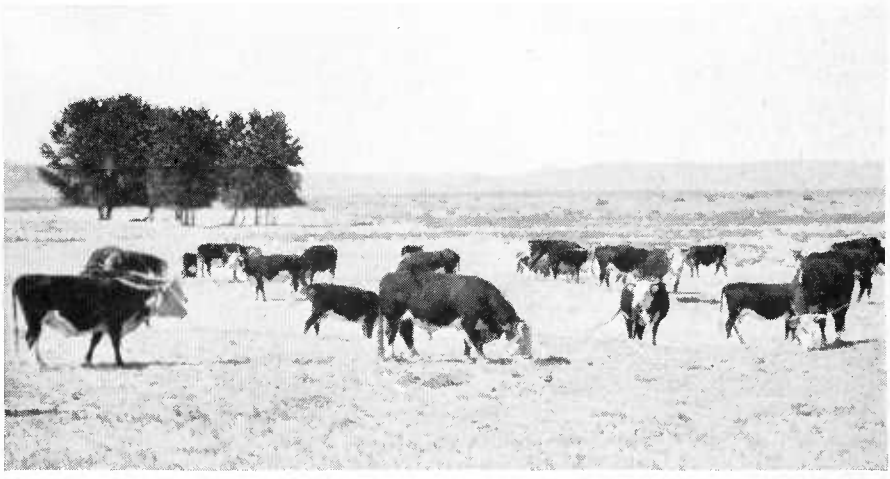

FIGURE 2.—Range cattle being fed cottonseed cake as a supplement to pasture.

cottonseed hulls, or the like. Good leafy green-colored hays, preferably legumes, silages and alfalfa meals are good sources of carotene (provitamin A). Vitamin A can also be supplied by A and D feeding oil, cod liver oil, or synthetic vitamin A.

It is customary to feed beef bulls from ½ to 1 pound of concentrates per 100 pounds of live weight in addition to the winter pasture (fig. 2). The concentrates may consist of any single grain or mixture of grains together with cottonseed meal in the ratio of about 4 or 5 to 1.

Suggested rations for wintering beef breeding cows averaging 1,000 pounds in weight

RATION 1	*Pounds*
Corn silage	30
Cereal straw or stover	Unlimited
Cottonseed meal	1½
RATION 2	
Corn (or sorgo) silage	25
Cottonseed meal	1 to 1½
Winter pasture.	
RATION 3	
Grass hay or stover	18
Cottonseed meal or cake	2
RATION 4	
Sorghum silage	30
Sorghum stover or cereal straw	Unlimited
Cottonseed meal or cake	1½

Dairy Cows

Cottonseed meal is an excellent feed for dairy cows. The protein it contains is as valuable for milk production, pound for pound, as the protein in linseed meal, soybean meal, peanut meal, and other high-protein concentrates. It can be fed in as large quantities as are needed to balance the ration without fear of injury to the cow. Like nearly all other concentrate feeds, cottonseed meal does not contain any appreciable amount of carotene, the substance which the animal transforms into vitamin A. If the cottonseed meal is fed along with cottonseed hulls, straw, or poor-quality hays, which also lack carotene, the cow will suffer from a deficiency of vitamin A. To prevent this, part of the roughage should consist of nicely cured hays, good silage, pasturage, or other green forage, all of which are rich in carotene. Where cottonseed meal is plentiful and cheap in comparison with farm grains, the cow can be fed relatively large amounts of cottonseed meal provided she also gets plenty of good roughage.

When large quantities of cottonseed meal and a poor roughage are fed to dairy cows, the butter produced is hard, tallowy, and light in color; however, moderate quantities fed with good roughage do not result in butter of undesirable quality. Some kinds of feeds tend to result in a soft butter and the addition of some cottonseed meal to the ration results in a butter of satisfactory body.

In the mixtures shown in table 4, ground corn can be partly or wholly replaced by feeds such as hominy feed, corn-and-cob meal, ear-corn chops, grain-sorghum head chops, dehydrated sweetpotato meal, dried citrus peel-and-pulp, or dried beet pulp. Oats can be replaced by ground or rolled wheat or barley, ground grain sorghums, or grain-sorghum head chops. Wheat bran can be replaced by rolled or ground wheat, or by oats or rice bran.

If whole-pressed cottonseed or low-grade cottonseed meal is fed, the quantity included in each grain mixture should be increased by about 50 pounds. In phosphorus-deficient areas it may be necessary to supply additional phosphorus if the grain mixture contains less than 25 percent of wheat bran and cottonseed meal combined. This can be provided by steamed bonemeal, dicalcium phosphate, or some other source of phosphorus according to the recommendations of the local State agricultural experiment station.

TABLE 4.—*Suggested grain mixtures containing cottonseed meal to be fed with different roughages*

Roughage	Approximate protein content desired in grain mixture	Grain mixture			
		Ground corn	Ground oats	Wheat bran	Cottonseed meal
	Percent	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Good-quality leafy legume hay or silage; or abundant immature pasture herbage	12	400	200	200	
Average-quality legume hay or silage alone; or good-quality legume hay or silage with corn or sorghum silage	14	350	200	200	50
Average-quality legume hay or silage with corn or sorghum silage; or good quality early cut mixed hay [1] alone; or mixed pasture herbage [1] grazed at a hay stage	16	300	200	200	100
Good-quality mixed hay [1] or silage with corn or sorghum silage; or average-quality mixed hay alone; [1] or good-quality early cut grass hay alone	18	250	200	200	150
Average-quality grass hay or silage alone or with corn or sorghum silage; or straight grass pasture herbage grazed at a hay stage	20	200	200	200	200

[1] Half grass and half legume.

The quantity of grain to feed will depend on the quantity and quality of the pasturage and other roughages available. Good pastures and roughages provide the best and cheapest feeds for a dairy cow, and the cow should be supplied with all of these that she can consume. Cows on pasture that provides an abundance of immature herbage will need grain for all production above 1 pound or so of butterfat per day; or for all milk produced above 30 pounds for Holsteins, 24 pounds for Ayrshires, Brown Swiss, and Milking Shorthorns, 20 pounds for Guernseys, and 18 pounds for Jerseys. Cows on less abundant pasture supplemented by plenty of good roughage or cows getting all the good roughage they will eat during the winter months will usually need grain for all production above one-half pound of butterfat per day; or for all milk produced above 15 pounds for Holsteins, 12 pounds for Ayrshires, Brown Swiss, and Milking Shorthorns, 10 pounds for Guernseys, and 9 pounds for Jerseys. For each pound of milk produced above the quantities stated, 0.40 pound of a good grain mixture will be needed by Holstein cows, 0.45 pound by Ayrshire, Brown Swiss, and Milking Shorthorn cows, 0.50 pound by Guernsey cows, and 0.55 pound by Jersey cows.

If the roughage is poor in quality, heavier grain feeding may be required.

Young Calves

Very young calves are susceptible to injury from feeding on cottonseed meal. The maximum amount fed at 6 months of age should not exceed a half pound daily. Calves running with their dams or being hand-fed on plenty of skim milk to

6 months of age can be raised on good hay and a mixture of low-protein farm grains. Calves raised on moderate amounts of milk to 90 or 120 days of age with good hay will need a grain mixture containing 14 to 16 percent of protein. Calves raised on very limited quantities of milk to 30 or 60 days will need a grain mixture or calf starter containing 18 to 20 percent of protein. The grain feeding of hand-fed calves is usually started at about 2 weeks of age, and between 4 and 6 months of age calves getting skim milk will be eating 3 pounds of grain per day, while those getting no milk will be eating 4 or more pounds per day. If linseed meal or soybean meal is substituted for half of the cottonseed meal, the same grain mixtures used for feeding cows will be suitable for feeding young calves.

Bulls and Heifers

Bulls and heifers of the dairy breeds intended for breeding purposes should be supplied with plenty of protein and mineral matter. With abundant immature pasturage or good-quality roughage, animals 6 to 9 months of age will not need more than 3 pounds of concentrates daily and beyond 9 months they will make good growth without any concentrates. The concentrates can consist entirely of low-protein farm grains with or without wheat bran. If pasturage or roughages are of poor quality the animals may need as much as 5 pounds of concentrates or more daily. Cottonseed meal can be used as a protein supplement after the animals have reached 6 months of age. The quantity of cottonseed meal or other supplemental protein needed in the grain mixture will be about the same for the kind of roughage fed as for milking cows.

Hogs

Cottonseed meal can be used effectively as a protein supplement in hog rations. It is advisable to use the meal in combination with other protein-rich feeds. In general, excessively high levels should not be used, although improved quality meals of low gossypol content are now being marketed which permit use of rather liberal levels and of reduction in amounts of other protein supplements.

In table 5 some protein-mineral mixtures suitable for hogs on pasture and in dry lot are suggested. It is advisable that the salt in the mixture in goitrous areas be iodized. These formulas contain 35 to 40 percent of crude protein depending on the level of tankage or fishmeal, both of which are

TABLE 5.—*Suggested mixtures for growing and fattening pigs*

Ingredient	Pigs on pasture weighing—		Pigs in dry lot weighing—	
	Under 75 pounds	Over 75 pounds	Under 75 pounds	Over 75 pounds
	Pounds	*Pounds*	*Pounds*	*Pounds*
Tankage or fishmeal	20		25	10
Cottonseed meal	25	30	25	30
Soybean meal	25	34	25	35
Peanut meal	25	30		
Alfalfa leaf meal (or ground alfalfa hay)			20	20
Ground limestone	3. 75	4. 5	3. 75	3. 75
Salt	1. 25	1. 5	1. 25	1. 25

generally higher in protein than the plant-source feeds. The protein mixtures should be fed along with corn, sorghum grains, barley, or combinations of grains, and may be fed in self-feeders either separate from the grain or mixed. When the latter course is followed, the proportions should be adjusted to give a protein content in accordance with good practice.

Inclusion of an antibiotic feed supplement, preferably one that also contains vitamin B_{12} either in the formula of the protein-mineral mixture or in the complete mixed diet, usually promotes more rapid gains in growing pigs. The amount of the supplement to use should be governed by the specific product chosen.

Horses

Cottonseed meal may be used as a protein supplement in rations for horses and mules. It is recommended that its use be restricted to limited amounts and that only meal of good quality be fed.

Cottonseed meal has met with some disfavor among horse feeders because of its reputed tendency to produce digestive disturbances. There may be some basis for this prejudice, because horses undoubtedly have been killed by feeding them excessive amounts of cottonseed meal. In many cases, however, the quality of the meal has been poor and the horses may have been poisoned by the moldiness of the feed. It is well known that horses are very susceptible to injury from eating moldy feed, particularly moldy cottonseed products.

Good-quality cottonseed meal when properly used has been found to give satisfactory results with both horses and mules. It is commonly used in the South in combination with corn or with blackstrap molasses and corn or other grain. The amount used is probably best limited to 1 to 1½ pounds per 1,000 pounds of live weight, although it has been fed successfully at higher levels. It is safest to start feeding cottonseed meal at a level not exceeding one-fourth of a pound a day and to gradually increase to the full allowance. The meal is not very palatable to horses and should be mixed well with other feeds. Its greatest usefulness is as a protein supplement to carbonaceous feeds such as corn.

Suggested rations for a 1,000-pound horse at medium work

Ration 1	*Pounds*
Oats	12
Timothy hay	12
Cottonseed meal	¾
Ration 2	
Shelled corn (dent)	8
Wheat bran	4
Mixed timothy and clover hay	10
Cottonseed meal	¾
Ration 3	
Rolled barley	10
Oat hay	12
Cottonseed meal	1
Ration 4	
Shelled corn (dent)	9
Molasses (cane)	2
Cowpea hay	6
Sorgo fodder	6
Cottonseed meal	1

Sheep

In feeding sheep it is highly important to balance the rations properly. Protein-rich concentrates can be used advantageously for this purpose. Cottonseed meal and cake have been used with satisfactory results. In limited quantities they have been found one of the best types of protein-rich supplements for use in fattening sheep.

Cottonseed meal and cake are also used to advantage in limited quantities for breeding ewes. One-half pound a day meets their requirements for a protein-rich concentrate, although these feeds are usually fed in connection with grains, forming from 10 to 15 percent of the grain ration.

Sheep should be started on cot-

tonseed products in small quantities. Lambs on full feed of forage and concentrates may receive up to one-third of a pound a day of cottonseed meal. Sheep usually relish cottonseed cake more than the fine-ground meal. It is advisable to use cottonseed meal in connection with corn, oats, or similar grain.

Suggested rations for a 60-pound fattening lamb

RATION 1

	Pounds
Shelled corn	1. 0
Grass hay	1. 0
Cottonseed meal	. 25

RATION 2

Shelled corn	1. 2
Alfalfa	. 4
Corn silage	. 6
Cottonseed meal	. 2

RATION 3

Corn silage	1. 2
Barley	1. 0
Cottonseed meal	. 2
Clover hay	. 6

RATION 4

Barley	. 6
Wet beet pulp	3. 0
Cottonseed meal	. 25
Prairie hay	1. 0

Cottonseed hulls can be used as roughage for fattening feeder lambs. A well-balanced diet is needed for satisfactory gains. Work at the Kentucky Agricultural Experiment Station has shown that good results can be obtained with a ration of the following composition: Cottonseed hulls, 0.7 pound; shelled corn, 1.3 pounds; cottonseed meal, 0.4 pound; alfalfa meal, 0.1 pound; and blackstrap molasses, 0.1 pound.

Poultry

As now commonly processed, cottonseed meal is a good source of protein for growing chicks, but it should not be used in diets for laying chickens because of its effect on egg-yolk color. When a large quantity of cottonseed meal—20 percent or more—is included in the diet of laying hens, many of the eggs may develop mottled yolks soon after they are laid. When such eggs are stored for a few weeks, the yolks may acquire a brown or chocolate color. Even if the diet contains as little as 5 percent of cottonseed meal, mottling and off-colors may develop in the yolks after the eggs have been stored a few months.

Although cottonseed meal should not be fed to laying chickens, it may be used to advantage in diets for growing chicks. The following mashes, containing soybean meal and cottonseed meal as the main protein concentrates, are suitable for growing chickens.

All-mash chick-starting diet:	Pounds
Ground yellow corn	42. 0
Fine-ground oats or wheat middlings	10. 0
Soybean meal	21. 0
Dried whey	5. 0
Fish meal	2. 5
Alfalfa leaf meal	6. 0
Cottonseed meal	10. 0
Steamed bonemeal	1. 1
Ground limestone or oyster-shell	1. 3
Manganized salt [1]	1. 0
Vitamin A and D feeding oil [2]	. 1
Total [3]	100. 0

Growing mash, to be fed with grain after the chicks are 6 weeks old:	
Ground yellow corn	35. 0
Fine-ground oats or wheat middlings	10. 0
Soybean meal	20. 0
Dried whey	6. 5
Fish meal or meat meal	3. 0
Alfalfa leaf meal	7. 0
Cottonseed meal	13. 0
Ground limestone or oyster-shell	2. 0
Manganized salt [1]	1. 5
Steamed bonemeal	2. 0
Vitamin A and D feeding oil [2] [4]	. 2
Total	100. 2

[1] The manganized salt is prepared by mixing 100 parts of salt and 2.2 parts of anhydrous manganous sulfate or 3.2 parts of manganous sulfate tetrahydrate.

[2] Feeding oil should contain 400 A. O. A. C. chick units of vitamin D and 2,000 International Units of vitamin A per gram.

[3] An antibiotic feed supplement added according to specified recommendations is also advised for promotion of maximum growth.

[4] To be fed here only if chicks do not have access to direct sunlight.

The grain to be fed with the above starting and growing mash may consist (1) entirely of corn, (2) of equal parts of corn and wheat, (3) of equal parts of corn, wheat, and oats, (4) of 2 parts of corn and 1 part of oats, or (5) of any other suitable grain or combination of grains.

Cottonseed Meal or Cake for Pasture Feeding

For years cattle feeders, particularly in the Southwest, have fed from 1 to 2 pounds of cottonseed cake per day to cows and steers on range in the fall and winter. Somewhat more cottonseed cake or some roughage as suggested on pages 5 through 7 should be fed when the grass is covered with snow and also during periods of grass shortage. During more recent years, the fattening of cattle on grass with cottonseed cake during the spring and summer months has been found to be an economical practice. The cake is usually preferred to the meal for grass feeding. A rain does not render the cake unpalatable, but it will often put the meal in such a condition that the cattle will not eat it. Again, no loss is incurred with the cake during windy days, whereas the meal, when fed in the open pasture, is sometimes wasted on account of the high winds. Furthermore, the cake requires chewing before being swallowed and therefore must be eaten very much slower than the meal, so when a number of steers are being fed together the greedy one has little chance to get enough cake to produce scours.

Experiments in the Southeast showed that the feeding of cottonseed cake to cattle on pasture caused the cattle to fatten more rapidly, to develop greater finish, and to make greater profits than similar cattle on pasture alone. The value of the cake as a supplement to pasture, of course, depends to a considerable extent on the nature of the pasture grasses, its use for legumes not being so profitable as with true grasses. In general the protein content of legumes is higher than that of grasses, therefore less cottonseed meal or cake is required to balance the ration. It is more economical to feed less cottonseed meal when the grass or legume pasture is made up of rapidly growing plants that are high in protein. As the plants in the pasture mature it is desirable to increase the amount of cottonseed meal. In this way the cattle have sufficient protein throughout the season and the pasture is used to the best advantage.

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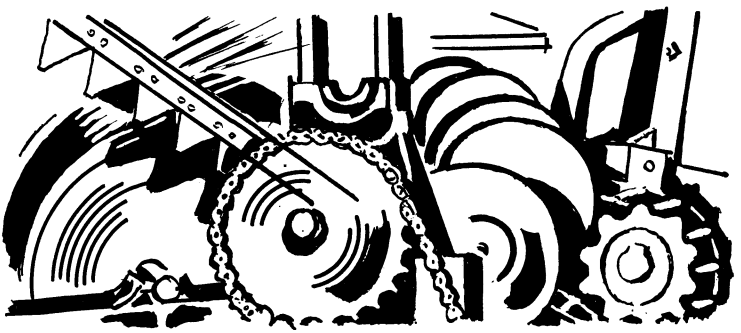

Don't take chances with FARM MACHINES

- Keep guards in place on power shafts, belts, and chains.
- Turn off power and block the machinery before unclogging or adjusting it.
- Don't climb over or around a running combine or thresher.
- Don't step over or under moving belts.
- Don't wear loose-fitting or torn clothing, or ragged gloves around moving machinery.
- Keep children away from machinery.
- Keep machinery in good repair.

Farm Machines will save you time . . .

If you use them the safe way